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PRELIMINARY REPORT OF
POINTS OF INTEREST IN AVIATION MEDICINE
AND PHYSIOLOGY IN BELGIUM AND FRANCE

8 January, 1945

Report by

Wing Commander R.H.WINFIELD, D.F.C.,A.F.C.

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PRELIMINARY REPORT OF POINTS OF INTEREST IN AVIATION MEDICINE AND PHYSIOLOGY IN BELGIUM AND FRANCE - 8 January 1945.

by

Wing Commander R.H.Winfield, D.F.C., A.F.C.

R.A.F. Physiological Laboratory

I. INTRODUCTION

This report gives an account of points of interest in aviation medicine and physiology observed during a brief visit to Belgium and France. It is proposed to make further visits as the war progresses and these will furnish material for future reports.

II. GERMAN OXYGEN PRODUCTION

Since the War began a steady flow of captured enemy aircraft has provided an ample supply of oxygen equipment from German machines. Although oxygen compressors have been found in the wake of the enemy retreat both in Africa and Belgium, German oxygen production has always been a matter of conjecture. This problem was therefore investigated as follows:

(a) Interrogation

On visiting the Prisoner of War Interrogation Section at T.A.F. Headquarters it was discovered that the question of oxygen production had never been broached at interrogation. A comprehensive questionnaire on this subject was therefore prepared, and a copy of this sent to the Interrogation Section in the United Kingdom. Information from this source should shortly be available.

(b) Examination of Equipment

Several dumps of abandoned enemy equipment were visited but no signs of either storage tanks for liquid gas were seen. Two GM.1 railway trucks were found in a railway siding at Antwerp. Each truck carried a large tank and one of these contained a liquid gas. An analysis of a sample sent to the Royal Aircraft Establishment at Farnborough, showed that the gas was not oxygen but nitrous oxide, which is used by the Germans to boost aircraft engines at altitude.

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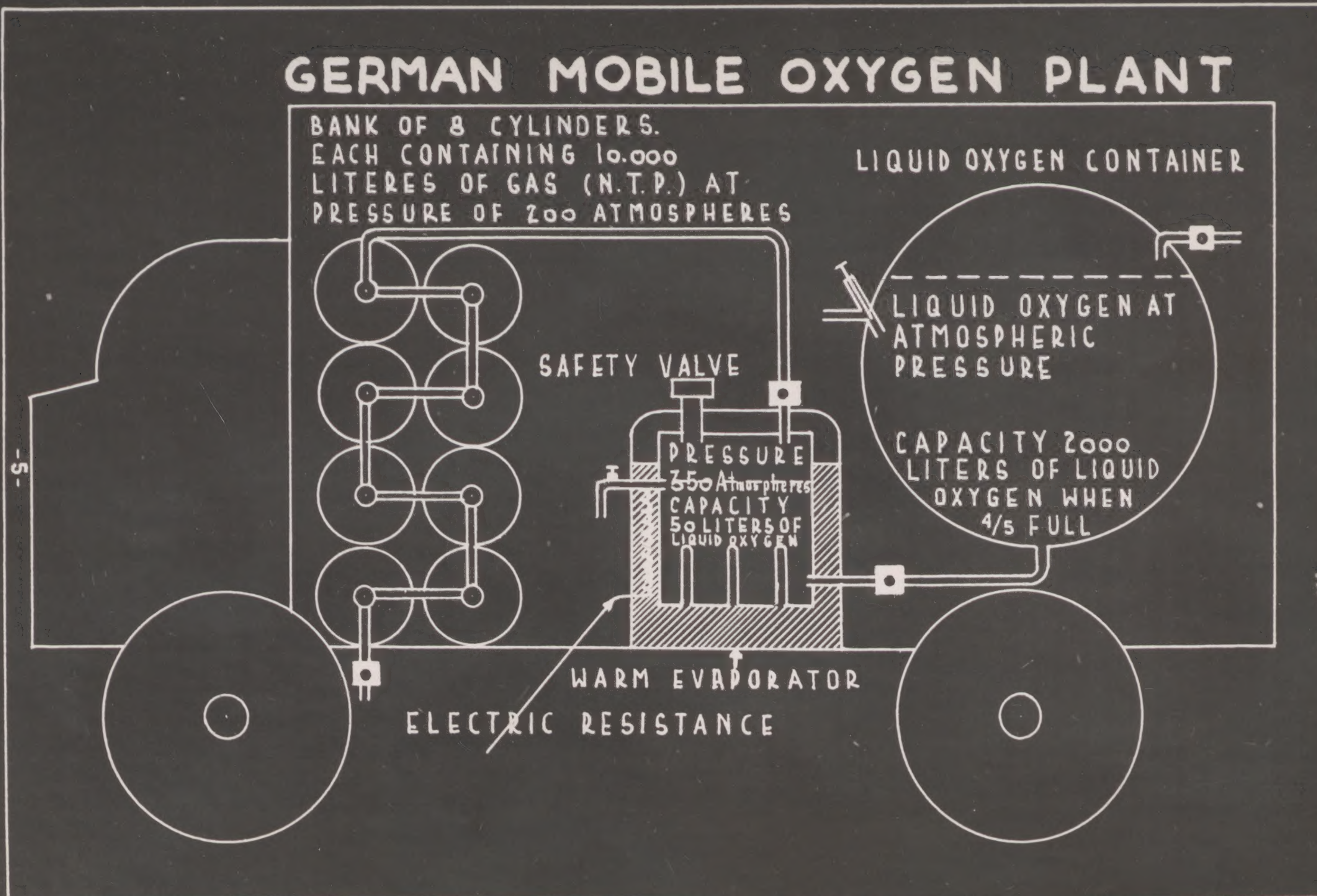
(c) Liquid Air Factories

Since it seemed likely that the Germans would use factories making liquid air for commercial purposes, to produce breathing oxygen, the Managing Director of the largest firm of this kind in Paris was interviewed. He and his staff proved most helpful and the following information was obtained.

Shortly after the occupation of France in June 1940 the Germans requisitioned the liquid air plant at this factory to provide breathing oxygen for their Air Force, and it was used for this purpose until it was damaged recently by Allied bombing. As the German oxygen requirement grew they also took over liquid air factories at Longwy, Cleremont Ferrand and Toulon. The factory at Toulon was mainly engaged in making liquid oxygen for the Italian and North African campaigns. Five or six German lorries were sent at frequent intervals to the factory in Paris to collect the liquid oxygen. These lorries were of a standard pattern and the unit consisted of a spherical oxygen container, an electrically heated evaporator and a bank of eight high pressure cylinders. The Chief Engineer drew a rough diagram of the layout from memory (See diagram, p. 5). Referring to this it will be seen that the spherical container held 2,000 litres of liquid oxygen when four-fifths full. On turning the tap liquid oxygen flows into the evaporator which has a capacity of 50 litres liquid. The evaporator is surrounded by a jacket containing water which is heated by an electrical resistance. The pressure in the evaporator will rise to 350 atmospheresbefore the safety valve blows off and thus the bank of eight cylinders each containing 10,000 litres of gas at N.T.P. can be charged to a pressure of 200 atmospheres. It will be seen that this gives a wastage rate of about 12 per cent.

Since the Germans relied on factories in occupied countries for the supply of breathing oxygen and then used lorries to transport it as a liquid to the field, it is not surprising that up to the present no warm evaporators have been found because as soon as the factories became endangered the lorries would naturally move away to other factories further from the battle zone.


GERMAN MOBILE OXYGEN PLANT
BANK OF 8 CYLINDERS.
EACH CONTAINING 10.000
LITERES OF GAS (N.T.P.) AT
PRESSURE OF 200 ATMOSPHERES
LIQUID OXYGEN CONTAINER
LIQUID OXYGEN AT
ATMOSPHERIC
PRESSURE
CAPACITY 2000
LITERS OF LIQUID
OXYGEN WHEN
4/5 FULL
SAFETY VALVE
PRESSURE
350 Atmospheres
CAPACITY
50 LITERS OF
LIQUID OXYGEN
WARM EVAPORATOR
ELECTRIC RESISTANCE

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There is still little information as to how the aircraft bottles are filled. Sufficient large transport cylinders similar to those mounted on the lorries have been found to suggest that batches of these are charged from the lorries and are then despatched to the various squadrons. The oxygen compressors previously discovered in North Africa and Belgium are possibly used both to evacuate the transport cylinders and in some cases to charge aircraft installations. More information on this point is required.

II. ENEMY AIRCRAFT

(a) General

A visit was made to the Farman Aircraft Factory at Suresnes where the Germans had recruited French labour to build Heinkel 177's. The Germans had planned to produce a hundred Heinkel 274's but the first prototype had not been completed when they left Paris. The aircraft was to be a four-engined high altitude pressure cabin nuisance bomber with a crew of four, and at the time of this visit the prototype was being finished by the French, who were expecting it to fly in about six months. The Heinkel 274 resembles the Heinkel 177 although each of the four Daimler-Benz 603 liquid cooled engines have a separate propellor, and since the pressure cabin containing the crew forms part of the nose of the aircraft, the fuselage is more tapered.

(b) Pressure Cabin

Three pressure cabins were examined at the factory; one of these was to be installed in a Heinkel 177 for test flights, while the other two, one of which was nearly completed, were for the prototypes of the Heinkel 274. The Germans had destroyed the drawings for the pressure cabin but it was considered that by cannibalising two of the three cabins a complete pressure cabin could be assembled.

(i) Size and Construction

The pressure cabin was oval in shape and roughly similar in size to that of the Wellington VI aircraft. It was built to hold a crew of four and the skin was made of pantal, a weldable duralumin. The holes used for flush rivets were sealed with strips of uncured rubber, and the cabin was insulated with glass wool. The nose, which formed about one fifth of the cabin, was constructed separately, and at its

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junction with the posterior four-fifths a thick rubber seal was employed.

(ii) Pressure

It was stated that the desired cabin pressure inside was 13.3 lbs. per square inch absolute. This was hard to believe because pressure was obtained from two compressors, one driven off each inboard engine; these were similar to the compressors used in the Messerschmit 109G (pressure cabin). Air entering the cabin was heated by exhaust gases contained in a jacket surrounding the inlet pipe. No means of removing air from the cabin were observed other than four spring loaded valves placed in the nose. It was therefore difficult to understand how a constant absolute pressure could be maintained inside the cabin regardless of altitude.

(iii) Escape Hatches

Entry to and exit from the cabin was through a single hatch two and a half feet in diameter placed in the floor just behind the nose. The hatch release was inside the cabin and worked by a toggle mechanism. In extreme emergency, escape could possibly be made with great difficulty through two smaller windows situated above and in front of the pilot and second pilots' seats.

(iv) Oxygen Supply

Five oxygen points were provided inside the cabin and five demand valves were fitted; these had neither the positive pressure attachment nor the alternative direct flow supply. The oxygen system was in keeping with the policy of maintaining a pressure equivalent to an altitude of 2,500 feet and using oxygen only in an emergency.

(v) Vision

The windows of the cabin and nose were made of double panels of plexiglass, hot air being blown between the two layers to prevent frosting. Visability from the cabin was disappointing since the panels in the nose were held in position by heavy metal struts two and a half inches wide. On the top of the cabin behind the pilot's seat a large upper dome was fitted. This also was made of two layers of plexiglass, but these layers were sealed and frosting was prevented by a plug which screwed into

the inner layer; this was made of porous material and was so shaped that it could be packed with dessicating chemical, and was identical with that used in the hood of the Messerschmit 109F. The dome could be rotated and had inset into it a flat plate of bullet-proof glass, presumably to protect the face of the fire controller as he revolves the dome to scan the sky.

(vi) Seating

The seats for the two pilots were similar to those in the Heinkel 177. The armour plate was moulded so that a back type parachute could be worn and the safety harness which was attached at the back of the seat reached the pilot's shoulders through slots in the armour plating. The height of the seat was adjustable through four inches by altering its position on a central pillar. Fore and aft movement was obtained by mounting the seat on a slide, and the back of the seat could be fixed at any angle between the upright position and an angle of 45° backwards to suit the pilot's convenience.

IV. DECOMPRESSION IN OCCUPIED COUNTRIES

(a) Belgium

When the Germans occupied Belgium in 1940 they took over the Decompression Chamber and Aviation Medicine Laboratory which the Belgian Air Force had established on the edge of the airfield at Brussels. This Aviation Medicine Unit was formed in 1937 and Captain Styns was appointed by the Belgian Air Force as a whole-time Medical Officer, to investigate problems associated with decompression. The Germans spent six months in trying to use the Decompression Chamber but owing to persistent sabotage were unsuccessful. They then removed the Chamber and its accessories to Germany, completely gutting the building and even going as far as to take away the electric light switches and radiators. Captain Styns was made a prisoner of war but was subsequently released, and proved most helpful in giving an account of the contents of his Laboratory and describing the type of work in which he had been engaged. He has provided the R.A.F. Physiological Laboratory with blue prints and photographs of the Decompression Chamber, one of which is reproduced on p.9.

Photo 1. Decompression Chamber

He has since found out that, although the Decompression Chamber was taken to Germany, the two electric decompression pumps were sent to the German Experimental Establishment at Rechlin for use in other kinds of work. The Belgian Chamber, which was about the same size as the large chamber at Farnborough, was provided with two locks, the smaller one being used for animal experiment. A standard ammonia refrigeration unit was also fitted. Up to 1940 Captain Styns was doing work on the effects of anoxia due to decreased pressure on the red and white blood cells. A study of the relationship between anoxia and metabolism by using the method devised by Professor Noyon was about to be begun when the Germans took over the laboratory.

Since in 1940 the most modern aircraft in the Belgian Air Force were represented by a single squadron of Hurricanes the problem of decompression sickness had not arisen.

At that time pilots of the Belgian Air Force were provided ith a direct flow oxygen system, using a B.L.B. mask modified to take a small electric heating coil to prevent freezing. Two rates of flow were provided, one for light, and another for heavier work.

(b) France

At the beginning of the War the French Air Force took over the Decompression Chamber at Le Bourget which was operated by Dr.Garsault. The Chambor was found at its original site in a building which had been destroyed by Allied bombing and, although the Chamber itself was relatively intact with the exception of the main door which had been badly wrenched, the communications between it and the power house had been destroyed. It had been used by the Germans for aircrew instruction and German oxygen equipment and intercommunication was provided. The Chamber would accommodate twelve subjects comfortably and standard German demand valves were fitted. Samples of this equipment were brought to Farnborough.

At each oxygen point what at first appeared to be an alternative oxygen supply was fitted. On investigation this was found to consist of Heinke tubing leading into the ventilation duct in the roof of the chamber, so that a subject connected to this would be breathing air when, presumably,he imagined that he was breathing oxygen.

The engine for this decompression chamber was electric and it appeared that provision for refrigeration by the ammonia process had been made, but must subsequently have been abandoned. Cursory examination would lead one to believe that it would not be very difficult to put this chamber in working order fairly rapidly.

French Mobile Decompression Chambers

General Beyne, Director General of the Medical Service of the French Air Force, was visited. He said that until German occupation the French Air Force had four mobile decompression chambers and, although he believed that two of these had been destroyed, he thought that two which had been hidden from the Germans still remained intact, and he was trying to find out where they were. No evidence could be obtained of the Germans using mobile decompression chambers in France or Belgium for education.

V. MISCELLANEOUS INFORMATION WA-4234 7

Dr. Heymans, Professor of Pharmacology at the University of Ghent, provided some interesting information about Aviation Medicine in the German Air Force. Dr. Strughold had visited him in Ghent and he had been to the Laboratory of Aviation Medicine at the Templehof, Berlin in the autumn of 1942. Medical Officers and civilians work on aviation medicine problems in this department under the direction of Dr. Strughold. Professor Heymans said that he saw several decompression chambers, some of which contained refrigeration units as well. The relative ease with which the Professor was allowed to visit this Centre, combined with the fact that no mention was made of Von Diringshofen, may indicate that Dr. Strughold's department deals mainly with the more academic point of research, and that possibly more practical and short-term work is carried out by Diringshofen elsewhere. Professor Heymans had a set of reprints of work carried out on aviation medicine in Germany up till the end of 1942. These have been brought to Farnborough for translation. Professor Heymans had been working on metabolic determination by Noyon's method and considered that it could be applied to work in the decompression chamber. He had shown that in the lightly anaesthetised dog benzedrine would increase metabolism by as much as 25%.

Although the Department of Physiology at Brussels had been closed during the German occupation, Professor Rylands said that the Germans had been working in the department on the change in blood volume and circulation rate in shock. The Germans were using dogs with exteriorised carotids and three of these which they left behind are available if required in this country. The work was being done by Dr. Schröter and Dr. Duesberg, under the direction of Dr. Waxmuth, all of whom are now prisoners of war in this country.

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